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The ground beneath: how climate justice mediates land-use sustainability in rapidly urbanising sub-saharan Africa

SOLOMON OKUNADE¹, JOE ASSOUA², ERIC BOMDZELE³, EVANS OSABUOHIEN⁴

¹*Chrisland University, Abeokuta, Department of Economics, Nigeria*

²*The Eastern and Southern African Management Institute (ESAMI), Arusha, Tanzania., Agricultural Economics,*

³*World Bank Group, Cotonou, Republic of Benin, Agricultural Economics,*

⁴*Centre for Economic Policy and Development Research (CEPDeR), Covenant University, Ota, Nigeria., Department of Economics, Nigeria*

Abstract

Sub-Saharan Africa (SSA) faces an increasingly complex bond of challenges associated with climate change, rapid urbanisation, and the sustainability of land use practices. Climate justice, which explains the equitable distribution of climate change burdens and benefits, emerges as a critical dimension of these interactions. Despite global attention, SSA remains disproportionately vulnerable to climate-related hazards, exacerbated by institutional and governance gaps. Concurrently, urbanisation in SSA is occurring at an unprecedented rate, projected to double by 2050. Rapid urbanisation across SSA collides with climate injustice and stressed land systems. This study tests whether climate justice, operationalised via governance readiness, rule of law, regulatory quality, press freedom and access to justice, mediates the link between urbanisation and sustainable land use (SLU). Using a panel of 28 SSA countries (2000–2023), we construct Principal Component Analysis-based indices for climate justice and SLU, and estimate Panel-Corrected Standard Errors, Driscoll–Kraay with fixed-effects errors, panel quantile regressions, and Kernel-based Regularised Least Squares (a robust machine learning tool). Three results are decisive. First, urbanisation imposes a large, robust penalty on SLU. Second, climate justice systematically offsets, and at higher SLU quantiles can reverse this penalty; interaction effects show stronger institutions redirect urban growth toward conservation rather than sprawl. Third, justice pillars are asymmetric since regulatory quality, rule of law and press freedom are unambiguously beneficial, while voice and access-to-justice exhibit short-run “enforcement frictions.” Conditional on institutions, GDP per capita is weakly related to SLU, challenging “grow-first, fix-later” assumptions; electrification and income attract urban concentration, while climate stressors accelerate urban migration. We argue for justice-centred urban policy by embedding justice metrics in planning, prioritising mid-urbanising countries for reforms, and professionalising municipal land governance. By integrating advanced econometrics with flexible ML, the paper provides the first cross-country quantification of climate-justice mediation in SSA’s urban land nexus.

Keywords: Climate justice, robust machine learning technique, Sub-Saharan Africa, sustainable land use, urbanisation

Contact Address: Solomon Okunade, Chrisland University, Abeokuta, Department of Economics, 210 steve biko rd muckleneuk pretoria, 0002 Abeokuta, Nigeria, e-mail: sokunade@chrislanduniversity.edu.ng